

## TABLE OF CONTENTS

CHAPTER	TITLE	PAGE
	DECLARATION	ii
	DEDICATION	iii
	ACKNOWLEDGEMENT	iv
	ABSTRACT	v
	ABSTRAK	vi
	TABLE OF CONTENTS	vii
	LIST OF TABLE	x
	LIST OF DIAGRAM	xi
1	INTRODUCTION	
	1.1 Introduction	1
	1.2 Statement of Problem	3
	1.3 Objective	4
	1.4 Scope of the Study	4
	1.5 Significance of Study	5

<b>2</b>	<b>LITERATURE REVIEW</b>	
	2.1 Introduction	6
	2.2 Features by Definition	6
	2.2.1 Gindy Form Feature Taxonomy	8
	2.3 Feature Technology	10
	2.3.1 Feature Based Design	11
	2.3.2 Feature Recognition	13
	2.4 Techniques in Feature Recognition	14
	2.4.1 Graph-Based Approach	15
	2.4.1.1 Graph Pattern Analysis	16
	2.4.1.2 Graph Search	18
	2.4.2 Volumetric Decomposition Approach	18
	2.4.2.1 Convex Hull Decomposition	20
	2.4.2.2 Cell-Based Decomposition	20
	2.4.3 Hint-Based Approach	21
	2.4.4 List of other methodologies developed for Feature recognition	22
<b>3</b>	<b>METHODOLOGY</b>	
	3.1 Introduction	26
	3.2 Features Chosen for the Project	26
	3.3 Attributes of the Selected Features	27
	3.4 General Process Flow of Proposed Methodology	32
	3.5 Feature Recognition Algorithm	33
	3.5.1 Input	34
	3.5.2 Preparation Phase	35
	3.5.3 Preliminary Data Extraction	35
	3.5.4 Feature Detection	36
	3.5.5 Feature Type Extraction	38
	3.5.6 Feature Coordinates Extraction	39
	3.5.7 Output	41

3.6	Illustrative Example	44
3.6.1	Preliminary Data Extraction	44
3.6.2	Feature Detection	45
3.6.3	Feature Type Extraction	48
3.6.4	Feature Coordinates Extraction	49
<b>4</b>	<b>SYSTEM VERIFICATION</b>	
4.1	Introduction	51
4.2	Performance Evaluation of the Feature Recognition	
	Algorithm	51
4.3	Comparison with Pattern Matching	59
4.4	Capability to recognize non-orthogonal features,	
	3D model and complex model	60
4.4.1	Feature Recognition of Non-orthogonal Feature	61
4.4.2	Feature Recognition of 3D Model	63
4.4.3	Feature Recognition of Complex Model	65
<b>5</b>	<b>CONCLUSION AND RECOMMENDATIONS</b>	
5.1	Introduction	68
5.2	Achievement of Objectives	68
5.3	Advantages of the System	69
5.4	Limitations of the Systems	70
5.5	Recommendation for future works	70
	<b>REFERENCE</b>	72

## LIST OF TABLE

<b>Table number</b>	<b>Title</b>	<b>Page</b>
<b>2.1</b>	Classification of Manufacturing Features According to Different Perspectives	8
<b>2.3</b>	List of graph based methods	15
<b>2.4</b>	List of volume decomposition	19
<b>2.5</b>	List of hint based methods	22
<b>2.6</b>	List of hybrid methods	23
<b>2.7</b>	List of new concepts / other method	24
<b>3.1</b>	Attributes of Selected Features	31
<b>4.1</b>	Results for number of notches versus recognition time	52
<b>4.2</b>	Results for number of steps versus recognition time	53
<b>4.3</b>	Results for number of slots versus recognition time	55
<b>4.4</b>	Results for number of open pockets versus recognition time	57
<b>4.5</b>	Recognition time of pattern matching and proposed method	60

## LIST OF DIAGRAM

<b>Figure number</b>	<b>Title</b>	<b>Page</b>
<b>2.1</b>	Example showing a feature can be defined with different perspectives.	7
<b>2.2</b>	Example of EAD count	9
<b>2.3</b>	Gindy's Features Taxonomy	10
<b>2.4</b>	Feature Model Generation Procedure	11
<b>2.5</b>	Feature Based Design	12
<b>2.6</b>	Feature recognition procedure	13
<b>2.7</b>	Feature Recognition	14
<b>3.1</b>	Selected features of the research	27
<b>3.2</b>	Example of vertex inside stock and vertex on stock face	28
<b>3.3</b>	Notch	29
<b>3.4</b>	Open Pocket	30
<b>3.5</b>	Slot	30
<b>3.6</b>	Step	31
<b>3.7</b>	General Process Flow Chart	33
<b>3.8</b>	General flow chart of the feature recognition algorithm	34
<b>3.9</b>	Icon to run the feature recognition macro	34
<b>3.10</b>	Stock size	36
<b>3.11</b>	Vertex inside stock for notch and open pocket	37
<b>3.12</b>	Vertex on primary stock face for step and slot	38

<b>3.13</b>	Coordinates of the bottom face of the features and coordinates of the top face of the features	40
<b>3.14</b>	Non orthogonal features:	
	(a) open pocket,	41
	(b) notch,	41
	(c) slot and	41
	(d) step	41
<b>3.15</b>	Feature recognition output:	
	(a) total recognition time,	42
	(b) preliminary information,	42
	(c) feature information and	43
	(d) final information	43
<b>3.16</b>	A simple model with orthogonal feature	44
<b>3.17</b>	Stock size	45
<b>3.18</b>	Vertices inside stock	46
<b>3.19</b>	Redundant vertices	47
<b>3.20</b>	Vertices on primary stock face	47
<b>3.21</b>	Vertices saved into array to eliminate redundancy	49
<b>3.22</b>	Coordinates of the features	50
<b>4.1</b>	Graph of number of notches versus recognition time	53
<b>4.2</b>	Graph of number of steps versus recognition time	54
<b>4.3</b>	Graph of number of slots versus recognition time	56
<b>4.4</b>	Graph of number of open pockets versus recognition time	58
<b>4.5</b>	Recognition time vs No of features graph	59
<b>4.6</b>	Non-orthogonal features	61
<b>4.7</b>	Recognition output for non-orthogonal features	62

<b>4.8</b>	Examples of invalid non-orthogonal features of the system	63
<b>4.9</b>	3D model	64
<b>4.10</b>	Recognition output for 3D model	65
<b>4.11</b>	Illustrative example of a complex model	66
<b>4.12</b>	Output document of the recognition of complex model	67